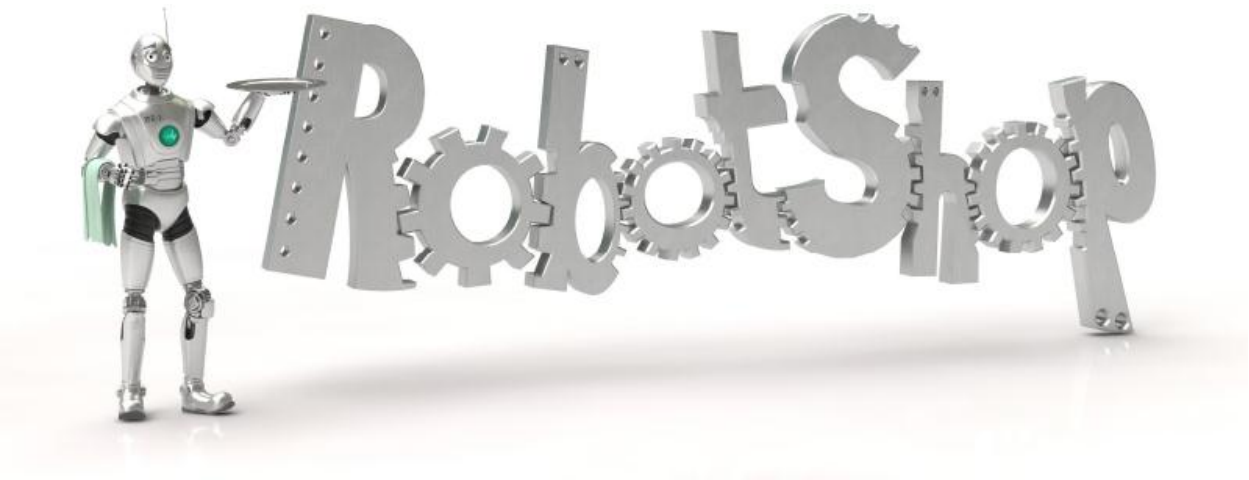

R o b o K i n d S p e c i f i c a t i o n s

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Head

The RoboKind robots provide an expressive face miniaturized to operate with a 2-foot tall walking body, together with software development tools.

Note: The heads are only available bundled with bodies

- With R-20 non-moving body, R-30 expressive arm body, or with the R-50 walking body.
- Available with rapid interface for changing heads out quickly.
- All heads but Geo have 10 degrees of freedom

Simple interface to the head

- The head detaches from the body by means of one simple button and a sliding mechanism and a single electronic connection.
- Easily removable from body, head can be attached to other bodies.
- The mechanical interface designs are to be released open source, so you can design to our interface.

Motorized vision control:

- Eye actions, plus neck actions, for tracking and gesture.
- The Eyes move independently, and contain 2 separate cameras for true binocular stereovision.
- Useful for visual motion, information gathering, and for expression.

Natural eyelid action

- Blink for expressions, impression of life.
- Can be used for light regulation for enhanced vision.

Simple servo change

- If motors go out, they are readily available and easy to replace
- Optional extended warranty covers maintenance including motor changes

Electronics

- **USB-based servo controller**
    - Controls the ten RoboKind head DOF, plus two empty servo slots allowing you to add individual DOF.
    - RS-232 serial servo control (SSC) protocol

- **Servo safety circuit**

- **Two high-def cameras:**
  - 720p, 30 fps.
  - USB 2.0.

- **Two microphones.**

- **Electrical characteristics**
  - 6 volts.
  - Continual current: 1.1A.
  - Max current: 3A.

Choice of Zeno, Einstein, Alice, and Geo faces

	Face	**Height**	**Weight**
Zeno	Male, cartoon character, modeled as a little hero.	6.5”/ 16.51cm, with hair (+-.5”)	Less than 1.5 lb. (.7kg)
Einstein	Male, portrait of the great physicist.	6.6”/ 16.76cm, with hair (+-.5”)	Less than 1.5 lb. (.7kg)
Alice	Female, cartoon character	6.5”/ 16.51cm, with hair (+-.5”)	Less than 1.5 lb. (.7kg)
Geo	Non-expressive, abstract, cartoon character	6.3”/ 16 cm, with hair	Less than 1.5 lb. (.7kg)

Expressive actions, eye motions, eyelids, and neck /head-pose:	**Available expressions:**
• Smile/Frown, • Brow-raise/Scowl, • Eyelids/blink, • Left-eye turn, • Right-eye turn, • Eyes up-down, • Jaw/mouth opening, • Head pitch (nod), • Head roll (tilt), • Head yaw (turn).	• All Ekman 7 transcultural, emotional expressions: Joy, sorrow, anger, fear, disgust, surprise, neutral. • Cognitive expressions: confusion, interest, agreement, disagreement, contempt, skepticism, etc. • Many other expressions. • The key to the expressions is patented Frubber™, a biomimetic polymer, combined with psychology, artistry, and robotics, to achieve lifelike expressions in a low-power, robust package.

Walking Body Specifications (for R-40 and R-50)

Optional body offered with RoboKind models R-40 and R-50, walks, dances, and gestures.

- Dynamically stabilizes using inertial sensors and on-board computer.
- Uses Dynamixel servos with Maxon motors.
- Includes a PC computer running robot control software for plug-and-play functionality.
    - Includes software for
        - Speech recognition and speaking,
        - Animation, including expressions,
        - Walking control,Vision including face tracking.
    - Includes an API and rapid development tools, for programmatic control.
- Different heads easily snap on and off, including the expressive faces.
- Expressive arms/hands, with optional grasping hands.
- Different genders/coloration for different ethnicities and styles.

Heads can fast-swap out:
• Slide on and off, with a quick change mechanism
• Exchangeable heads utilizing Geo head, Alice, Zeno, Einstein, or other heads.

Height:
• With heads: 23.5" (60cm) to 25" (63.5 cm).
• Body without head: ~18" (45.5 cm).

Weight
• Body with head: under 6.5 kg.
• Body without head: under 5 kg.

Twenty-five (25 DOF) in the body:
• Twelve (12) DOF legs, all-Dynamixel RX-64 servomotors in the legs and hips,
• One (1) RX-28 servo-motor in the waist,
• Two RX-64 Dynamixels in the shoulders,
• Four (4) RX-28 servos for additional arm movement.

Electronics

Voltage: • Nominal operating voltage: 18v • Max voltage: 22v • Min voltage: 14v **Current**: • Continuous duty: 1A to 3.5A (depends on activity) • Intermittent duty: ~9 A.	**Power supply included** **Batteries and charging** • Two (2) Lithium rechargeable batteries, one in each foot of the robot. • Battery charger, with circuitry for controlled charging and discharge

Sensors
• IMU, 9 axis (3 axis gyro, 3 axis accelerometer, 3 axis compass).
• Bump sensor in each foot.
• Temperature, torque/load, and position sensors in 21 DOF in the body and legs.
 Many additional sensor upgrade options available for additional cost (note these are not included in base models, and some DIY implementation may be required).
• Ultrasonic rangefinders,
• IR proximity sensors,
• PIR sensors,
• LIDAR.
• Many others.

Powerful RoBoard computer on board:
Processor: 1Ghz Vortex86DX x86 CPU
Memory: 256MB DDR 2,
Storage: up to 16 gig SD,
ADCs: Analog Devices AD-7918 10-bit,

I /O Interface: • **Micro SD slot x1** o Support class 2,4,6 SDHC with any capacity • **USB port x 1 (USB 2.0 version)** • **Connectors** o 2.54 mm 10-pin box header for RS-232 x1 o 2.54 mm 10 -pin box header for USB x1 o 2.0 mm 4-pin header for RS-485 x1 o 2.0 mm 4-pin header for TTL serial x1 o 2.54 mm 10 -pin box header for SPI & I 2C x1 o 2.54 mm 16-pin header for A/D x1 o 1.25 mm 3 -pin wafer for TTL serial x 1 o 1.25 mm 4 -pin wafer for LAN x 1 o 1. 2 5 mm 4-pin wafer for MIC-in x 1 o 1. 2 5 mm 4-pin wafer for Lineout x1	• **Power Consumption** +5V @ 400mA • **Power Input** DC-in 6V to 24V • **Dimension** 96 x 56 mm • **Weight** 40g • **Resolution** PWM: 20ns o Serial: 115200bps o I2C: 1Kbps ~ 3.3Mbps o SPI: 10Mbps to 150Mbps Half-Duplex; o CPOL=0/1,CPHA=1 Clock mode • **Included OS:** Debian Linux o The computer is also Compatible with other O/S: DOS, Windows 98/ME, Windows XP, CE, Linux distribution kernel 2.4.x, 2.6.x. HOWEVER, Our software is only certified for use with the Debian Linux install that ships with the RoboKind product. • Wi-Fi, 802.11g.

o 1. 2 5mm 6-pin wafer for JTAG x1 o 0.8mm 124-Pin Mini PCI Card connector o 3.96 mm 2 pin for Power x 1 o PWM (great for additional servomotor control)	

R-20: Expressive robotic face with static body

• Static Body, Non-walking
• Expressive face: Einstein, Geo, and Zeno, as described above.
• Static version of our R-50 body designs.
• Einstein, Geo, and Zeno have the same body designs.
• For Alice, we provide a female-proportioned body.
• Base is an enclosed box, holding the electronics.
• USB connects to your computer to control the robot.
• Control the robot from your own (not included) computer. No computer included with R-20.
• AC adapter, Compatible with 110v or 220v
• Stable desktop base.

R-30: Expressive Face, and gestural, non-walking body

• Expressive arms and waist turn.
• Expressive face: Einstein, Geo, and Zeno, as described above.
• Expressive-only version of our R-50 body designs.
  - Einstein, Geo, and Zeno have the same body designs.
  - For Alice, we provide a female-proportioned body.
• Base is an enclosed box, holding the electronics.
• Control the robot from your computer.
• USB connects to your computer to control the robot.
• Control the robot from your own (not included) computer. No computer included with R-20.
• AC adapter, Compatible with 110v or 220v
• Stable desktop base.

R-40: Walking body, non-expressive face.

• Geo face, without expressions, but with moving eyes.
• Body specifications are the same as above

R-50: Walking body, with Expressive face

• Body specifications are the same as described above.
• Expressive face: Einstein, Geo, and Zeno, as described above.
• Body differences:

RoboKind Product Descriptions.

• Einstein, Geo, and Zeno have the same body designs.
• For Alice, Hanson RoboKind will provide a female-proportioned body if requested.

Software
• Software supplied with all models.
• Works with all platforms.
• Open source

- Our software will be released under the BSD license.
- Some modules may be covered under GPL or other licenses, while some peripheral components may be subject to proprietary, third-party licenses.

• Easy to use

- Easy to use even for both for the technophobes and the techno savvy.
- Easily animate and control facial expressions.
- Straight-forward, modular API.

• Animation editor and authoring tools:

- Easy to use, no technical experience needed.
- Comes loaded with a library of ready-made animations and expressions.
- Powerful time-line animation editor to generate your own animations and expressions.
- Text to Speech with automatic lip-syncing.
- Import sound files for custom synchronizing.

• Out of the box functionality

- Automated demo mode with simple start up.
- Walking, Talking, Vision-based tracking, and Speech command recognition.
- Storytelling, Dancing and engaging Animations.
- Useful for some experiments with little or no additional development.

• Tools for research experiments

- Easily animate and control facial expressions, body gestures, and interactivity for Psychology experiments.
- Software API allows for data capture and advanced controls.

• Open API

- Powerful animation API for optional, custom control of the robot's motion, for interface with your software.
- Speech recognition and TTS synthesis tools.
- Vision tools, including realtime face detection and tracking.
- Dynamic stabilization for walking and balancing.

• Java-based control libraries allow access and control of low-level sensor

and motor data, including:
- Building and playing animations.
- Direct motor control.
- Motor sensor data, including position, temperature, and load.

RoboKind Product Descriptions

• Text-to-Speech and control of audio output.
• Camera and audio data.
- Includes a C++ interface, allowing interoperability with C++ projects.
- Network control interface.
- Java modularity, C++ interfaces and open source code enable compatibility with numerous other platforms with modest additional development, such as: ROS, Robotics Studio, Labview, Matlab, SciLab, and others.
• Latest Software Technologies

- Built on top of the NetBeans Rich-Client Platform
- Uses OSGi for a modular design.
- Open source developer program for building modules that combine into intelligent systems. A sizeable community of developers has already adopted and invested in the technology, resulting in a growing number of modules and tools. Participate with your own and we all move ahead!

Miscellaneous

• Manuals and Documentation

- Product brochures.
- Technical Specifications.
- User Manual.
- Software documentation (browse or download online).

• Packaging

- RoboKind comes in a cardboard and foam box.
  - Hard-shell case: $800 extra
  - attractive hard-shell carrying case for the robots,
  - Safe for shipping and safe for airplane carry-on.

• Grasping Hands upgrade

- Two extra DOF
- Wrist turn
- Hands open and close

- Easy sliding attachment feature, for rapid interchange.

• Self-Maintenance and Modifications

- Easily modify or upgrade the robot yourself. Built for scientists looking to innovate
- Open platform, Open source hardware and software.
- Large community to share mods with you.

• Easily changeable the motors and other hardware parts—

- Dynamixel motors and commercial hobby servos are readily available.
- Easy to change out.
- Limited 90 day warranty covers only manufacturer's defects.

Extended Warranty/Maintenance plans

- Extended warranties protecting against accidental damage and normal wear and tear are available at additional cost.
- Available for either one year or three years.
- Areas covered, compared to limited 90 day warranty:

Areas Protected	**Limited**	**Extended**
Manufacturer's defects	**Yes**	**Yes**
Extra years protection	No	**Yes**
Replacing servos that go out	No	**Yes**
Coverage of normal wear and tear	No	**Yes**
Software upgrades	No	**Yes**
Computer or electronics failures	No	**Yes**
Accidental Frubber facial, or body damages (limited, see terms & cond's)	No	**Yes**